

PATENT ABSTRACTS OF JAPAN

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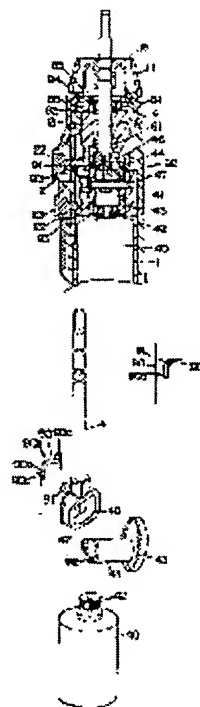
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(54) MOTOR-DRIVEN TOOTH-BRUSH

(57)Abstract:

PURPOSE: To clean teeth with reciprocating motion and oscillating rotation by setting the stop position of an output section always at the same position, and by rotating the output section to be oscillated in a range in the fixed direction from the stop position, to bring the output section into contact with tooth faces at a proper angle.

CONSTITUTION: An oscillating guide 90 is a perpendicular linear section 90a, first, and is turned into a circular curve section 90b to be a rotary guide on the way, and with a stopper 90c, an oscillating guide projection 91 is stopped not to be rotationally moved furthermore. The most eccentric section of an eccentric shaft 44 is provided with a magnet 92, and the side of a main body 1 is provided with a Hall element 93 to be confronted with the magnet. The position of the magnet 92 of the eccentric shaft 44 is detected by the Hall element 93, and a power source stopping switch is pushed and after that, the current of a motor 40 is controlled so that the magnet may come to the lowest end. When the stopping position of the output section is contrived to be set at the stroke end of linear reciprocating motion, then an oscillating rotational angle is turned clear, and the output section is easily brought into contact with sections between teeth and gum sections at a proper angle, and the gum sections are not harmed by turn over. With the eccentric shaft 44, a cam follower 46 and a driving shaft 4 are moved reciprocatively and vertically, and with combined working, brush does not enter the sections between teeth.



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CLAIMS

[Claim(s)]

[Claim 1] the electric toothbrush which has the output section in which the straight-line reciprocating motion of shaft orientations is possible -- setting -- the halt location of the output section -- always -- the same -- under a straight-line reciprocating motion -- the circumference of an output shaft center from a halt location -- rocking of the fixed direction range -- the electric toothbrush characterized by having a pivotable means and changing.

[Claim 2] The electric toothbrush according to claim 1 characterized by the halt location of the output section being the stroke edge of straight-line reciprocation.

[Claim 3] The electric toothbrush according to claim 1 characterized by equipping the interior of a body with the straight-line reciprocating motion means of shaft orientations, and the rocking rotation means of the circumference of a shaft center.

[Claim 4] The electric toothbrush according to claim 1 characterized by having had the straight-line reciprocating motion means of shaft orientations in the body, and equipping a body and a removable attachment with the rocking rotation means of the circumference of a shaft center.

[Claim 5] The electric toothbrush according to claim 1 characterized by having had the rocking rotation means of the circumference of a shaft center in the body, and equipping a body and a removable attachment with the straight-line reciprocating motion means of shaft orientations.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the gear-tooth brush used as oral hygiene tools, especially an electric toothbrush.

[0002]

[Description of the Prior Art] It is almost the case which sets to the conventional electric toothbrush, and the gear-tooth brush section reciprocates or rolls. And especially in reciprocation, brush section hair ends are caught in the interdendum section of a molar, a stroke decreases, and the brushing effectiveness decreases. Moreover, in rolling actuation, since rocking movement was carried out from the gear-tooth brush section fitting location at the circumference both sides of an output shaft and a halt location did not become settled uniquely, either, the gum section had been turned over, the brush section rocked, and there was a possibility of giving a blemish to the gum section. Moreover, although there were some repetitive rotation or a brush bundle carries out [some / the brush section] repetitive rotation in the conventional electric toothbrush, in this thing, every place needed to be applied between one gear tooth, one gear tooth, or gear teeth, and it needed to carry out, and had taken time amount.

[0003]

[Problem(s) to be Solved by the Invention] The place which invents this invention in view of the above-mentioned point, and is made into the purpose The halt location of the gear-tooth brush section is always made regularity, and it is easy to put in a right include angle to the parts of a gear tooth and the gum. It rocks, while actuation of the brush section also reciprocates, and the interdendum section can also be cleaned widely [area / brushing] as actuation which carries out rocking rotation (rolling) while carrying out reciprocation (bus) to shaft orientations for brush section actuation, without catching the brush section. Moreover, an effectiveness aerofoil, It is in offering the electric toothbrush which can carry out brushing between a gear tooth and the gums and of between a gear tooth and gear teeth.

[0004]

[Means for Solving the Problem] the electric toothbrush which has the output section which the electric toothbrush of this invention can straight-line reciprocate [of shaft orientations] in order to solve the trouble of the above-mentioned conventional example and to attain the purpose of this invention -- setting -- the halt location of the output section -- always -- the same -- under a straight-line reciprocating motion -- the circumference of an output shaft center from a halt location -- rocking of the fixed direction range -- it is characterized by to have a pivotable means and to change.

[0005] Moreover, it is desirable to make the halt location of the output section into the stroke edge of straight-line reciprocation. Moreover, it is desirable to consider as the configuration which equipped the body 1 interior with the straight-line reciprocating motion means of shaft orientations and the rocking rotation means of the circumference of a shaft center. Moreover, it is also desirable to consider as the configuration which was equipped with the straight-line reciprocating motion means of shaft orientations in the body 1, and equipped the removable attachment 10 with the rocking rotation means of the circumference of a shaft center at the body 1.

[0006] Furthermore, it is also desirable to consider as the configuration which was equipped with the rocking rotation means of the circumference of a shaft center in the body 1, and equipped the removable attachment 10 with the straight-line reciprocating motion means of shaft orientations at the body 1.

[0007]

[Function] In the electric toothbrush which carries out a deer and has the output section in which the straight-line reciprocating motion of shaft orientations is possible in this invention the halt location of the output section -- always -- the same -- under a straight-line reciprocating motion -- the circumference of an output shaft center from a halt location -- rocking of the fixed direction range -- by considering as the configuration which has a pivotable means It faces brushing teeth by applying the brush section to a tooth flank, puts in a right include angle, and toothbrushing becomes possible, and toothbrushing comes to be able to perform brush section actuation in the reciprocation (bus) to shaft orientations, and the compound control action of rocking rotation (rolling).

[0008]

[Example] Hereafter, this invention is explained in full detail based on the example shown in an accompanying drawing. An electric toothbrush consists of a thin ellipse tubed body 1 which contained the battery 5 and the motor 40 grade, and the gear-tooth brush section 6 connected with the driving shaft 4 projected from the tip of a body 1. As shown in drawing 1 and drawing 2, inside the body 1 with which coverings 11 and 12 were respectively attached in upper limit and a lower limit, the frame 13 equipped with the motor 40 or the cam block 41 and the cell electrode holder with which it was equipped with the battery are contained. The above-mentioned driving shaft 4 is also supported with the frame 13, and is connected with the motor 40 through the cam block 41. 15 in drawing is waterproofing rubber for waterproofing of body 1 point, 2 is a switch, and this is formed as what consists of a contact surface (not shown) turned on and off by the mutual actuation of the push-on switch 22 and the push off switch 23 allotted to the front face of a body 1 in connection with a motion of the switch plate 29 which performs seesaw **, and the switch plate 29.

[0009] The above-mentioned cam block 41 is what changes rotation of a motor 40 into a both-way rectilinear motion of a driving shaft 4. The contrate gear 43 which meshes to the pinion 42 with which is supported with the shaft 47 with which both ends were supported with the frame 13, and the output shaft of a motor 40 is equipped as shown in drawing 4, The cam follower 46 which it consists [cam follower] of a contrate gear 43, an eccentric shaft 44 formed in one, and a cam follower 46 which engages with an eccentric shaft 44, and locates an eccentric shaft 44 in the interior of an oblong hole is formed in the lower limit of the driving shaft 4 with which the frame 13 was equipped with the shaft-orientations slide free.

[0010] When a motor 40 rotates an eccentric shaft 44 through a pinion 42 and a contrate gear 43, a cam follower 46 and a driving shaft 4 are made, as for an eccentric shaft 44, to reciprocate up and down. Although a driving shaft 4 needs to perform anchoring of the driving shaft 4 to a frame 13 through a bearing since it reciprocates shaft orientations, it is supporting the driving shaft 4 by the antifriction bearing 81 and 81 with which the frame 13 was equipped here.

[0011] As the antifriction bearing 81 which supports driving shaft 4 point is shown in drawing 5, when it consists of an annular retainer 82, a ball 83 respectively arranged in the slot 84 of the shaft orientations currently formed in the retainer 82, and an outer ring 85 surrounding the periphery of the both ends of the ball 83 in a retainer 82 and a driving shaft 4 reciprocates shaft orientations, a ball 83 enables it to move to shaft orientations. [two or more]

[0012] And the gear-tooth brush section 6 is attached at the tip of the driving shaft 4 which performs both-way rectilinear motion free [attachment and detachment]. The brush section 36 has protruded on the point in the direction of a right angle to the shaft orientations of the gear-tooth brush section 6 at the gear-tooth brush section 6. Each example of actuation of the gear-tooth brush section 6 is shown in drawing 6 and drawing 7. If the lower limit location at the time of the gear-tooth brush section 6 performing a straight-line reciprocating motion now is set to (a), the mid-position is set to (b) and an upper limit location is set to (c), it will set in the example of drawing 6. Although the brush section 36 prepared in the gear-tooth brush section 6 in the lower limit location (a) and the mid-position (b) of a

straight-line reciprocating motion has turned to the gear-tooth brush section 6 perpendicularly to the space of drawing 6. At the time of an upper limit location (c), it is θ_1 . Include-angle rocking rotation is carried out and actuation which is set to $\theta_1 \rightarrow 0$ when it returns from an upper limit location (c) to the mid-position (b), and becomes 0 also in a lower limit location (a) is carried out. Moreover, in the example of drawing 7, although the brush section 36 prepared in the gear-tooth brush section 6 in the lower limit location (a) of a straight-line reciprocating motion has turned to the gear-tooth brush section 6 perpendicularly to the space of drawing 6 it moves up -- alike -- taking -- the mid-position (b) -- θ_2 and an upper limit location (c) -- θ_1 as -- rocking angle of rotation becomes large gradually, and actuation which is set to $\theta_1 \rightarrow \theta_2 \rightarrow 0$ is carried out as it returns from an upper limit location (c) to a lower limit location (a).

[0013] Each example Fig. which performs the straight-line reciprocating motion of shaft orientations to drawing 4 and drawing 8 by the cam follower 46 which engages with the contrate gear 43 which meshes to a pinion 42, the eccentric shaft 44 formed in one, and an eccentric shaft 44, and was made to perform rocking rotation of the fixed direction range to the circumference of an output shaft center by the rocking guide 90 and the rocking guide height 91 is shown. It has protruded from the cam follower 46 and the rocking guide 90 is formed in the frame 13 of a body 1 for the rocking guide height 91. And if a driving shaft 4 moves up and down by rotation of a deflection axis 44, while the rocking guide height 91 will rise and will come down and carry out a rocking guide, it has structure which turning effort produces. Here, in order to consider as the structure used as arc curvilinear section 90b for carrying out the rotation guide of the rocking guide 90 from the middle by perpendicular bay 90a at first like drawing 4 for carrying out a motion like drawing 6 (from the upper limit which it is got blocked and is a bay) and to carry out the rotation guide of the rocking guide 90 from the beginning like drawing 8 for carrying out a motion like drawing 7, the structure where the whole is arc curvilinear section 90b is carried out. In drawing 4 and drawing 8, 90c is a stopper, and the rocking guide projection 91 is carrying out the duty stopped so that it may not rotate any more. drawing 9 -- the lower limit location in the case of drawing 8 (a), the mid-position (b), and an upper limit location (c) -- the relation of the deflection axis 44 and cam follower 46 which boil, respectively and can be set, the relation between a driving shaft 4, the rocking guide height 91, and the rocking guide 90, and the mutual relation of the sense of the brush section 36 are shown.

[0014] By the way, although the halt location of the output section which carries out both-way rectilinear motion in this invention is always fixed, the halt location of this output section that carries out both-way rectilinear motion is performed as follows in the example for always making it regularity. That is, the magnet 92 is formed in the part as for which the deflection axis 44 carried out eccentricity most, the hall device 93 corresponding to a body 1 side is formed with the magnet, magnet 92 location of a deflection axis 44 is detected by the hall device 93, and after pushing a power-source safety switch, motor 40 current is controlled by the example so that a magnet comes to the lowest edge. The block diagram is shown in drawing 10. And it is made to be the stroke edge of straight-line reciprocation of the halt location of the output section in the example. In addition, location detection of a deflection axis 44 may not be limited only to this, and may be a means using an encoder etc.

[0015] Although the above-mentioned example showed the example which equipped the body 1 interior with the straight-line reciprocating motion means of shaft orientations, and the rocking rotation means of the circumference of a shaft center, drawing 11 thru/or drawing 13 are equipped with the straight-line reciprocating motion means of shaft orientations in a body 1, and the removable attachment 10 is equipped with the rocking rotation means of the circumference of a shaft center. That is, in this example, covering 11 constitutes the removable attachment 10 on the body 1. Drawing 11 is drawing showing the straight-line reciprocating motion means established in a body 1, and performs the straight-line reciprocating motion of shaft orientations by the cam follower 46 which engages with the contrate gear 43 which meshes to a pinion 42, the eccentric shaft 44 formed in one, and an eccentric shaft 44. If the rocking guide slot 94 aslant established in the wall is established in the attachment 10, the rocking guide height 95 which formed the gear-tooth brush section 6 in the gear-tooth brush section 6 by fitting into a driving shaft 4 is inserted in this rocking guide slot 94 and a driving shaft 4 carries out a straight-line

reciprocating motion, rocking rotation will be carried out to the circumference of a medial axis by the rocking guide height 95 moving the inside of the rocking guide slot 94. The method of the rotation can be considered as the same rotation as drawing 6 or drawing 7 with the configuration of the rocking guide slot 94.

[0016] Moreover, the example of further others of this invention is shown in drawing 14 thru/or drawing 16. In this example, one within a body is equipped with the rocking rotation means of the circumference of a shaft center, and a body 1 and the removable attachment 10 are equipped with the straight-line reciprocating motion means of shaft orientations. That is, also in this example, covering 11 constitutes the removable attachment 10 on the body 1. Drawing 14 is drawing showing the rocking rotation means established in a body 1, and is performed by the cam follower 46 which engages with the contrate gear 43 which meshes to a pinion 42, cam 44a formed in one, and cam 44a. Circle-like cam 44a is formed in the periphery of the shank which protruded perpendicularly from the contrate gear 43 here, and the axial center of cam 44a of the shape of this circle inclines to the axial center of the shank which protruded perpendicularly from the above-mentioned contrate gear 43. And a driving shaft 4 carries out rocking rotation because this cam 44a engages with a cam follower 46. Have established the guide slot 97 for a straight-line round trip aslant established in the wall in the attachment 10 attached in the body 1 free [attachment and detachment] on the other hand, and the gear-tooth brush section 6 by fitting into a driving shaft 4 If the height 98 for a straight-line guide prepared in the gear-tooth brush section 6 is inserted in this straight-line reciprocation guide slot 97 and a driving shaft 4 performs rocking rotation, straight-line reciprocation will be carried out because the height 98 for a straight-line guide moves in the inside of the straight-line reciprocation guide slot 97. The actuation is shown in drawing 16 and the mutual relation of the relation between cam 44a and a cam follower 46, the location of a driving shaft 4, and the sense of the brush section 36 is shown in drawing 16 (a), (b), and (c). and (a) -- like -- the inclination of cam 44a -- a cam follower 46 -- fitting in -- θ_1 only -- it rotates. this time -- a cam follower 46 and a driving shaft -- θ_1 only -- if the fitting location is set up -- (a), the mid-position (b), and an upper limit location (c) -- becoming -- a cam follower 46 -- θ_1 only -- if it rocks -- a driving shaft 4 -- zero to $2\theta_1$ It will rock. Moreover, a halt location is made to rotation of the circumference of the output shaft center of the fixed direction by surely being referred to as (a). And corresponding to [the above (a) / (c) / location / upper limit] corresponding to the mid-position in the lower limit location of vertical migration, and (b).

[0017]

[Effect of the Invention] In the electric toothbrush which has the output section in which the straight-line reciprocating motion of shaft orientations is possible as mentioned above if it is in this invention the halt location of the output section -- always -- the same -- under a straight-line reciprocating motion -- the circumference of an output shaft center from a halt location -- rocking of the fixed direction range, since it has the pivotable means When applying the brush section to a tooth flank, it is easy to put in a right include angle, a toothbrushing area according [and] to the brush is large, and brushing is carried out, without catching the brush section also in the part between gear teeth by the compound control action of straight-line reciprocation and rocking rotation, and toothbrushing can be done efficiently.

[0018] Moreover, the halt location of the output section becomes clear [rocking angle of rotation] in what was made into the stroke edge of straight-line reciprocation, and it is easy to put in a proper include angle between a gear tooth and the gum, and toothbrushing can be done efficiently, without having turned over the gum and damaging it. Moreover, in what equipped the interior of a body with the straight-line reciprocating motion means of shaft orientations, and the rocking rotation means of the circumference of a shaft center, since the mechanical component itself is carrying out straight-line reciprocating motion and rocking rotation, the gear-tooth brush section serves as a shank like before, and a configuration of only the brush section, and can use the ** brush of the conventional electric toothbrush.

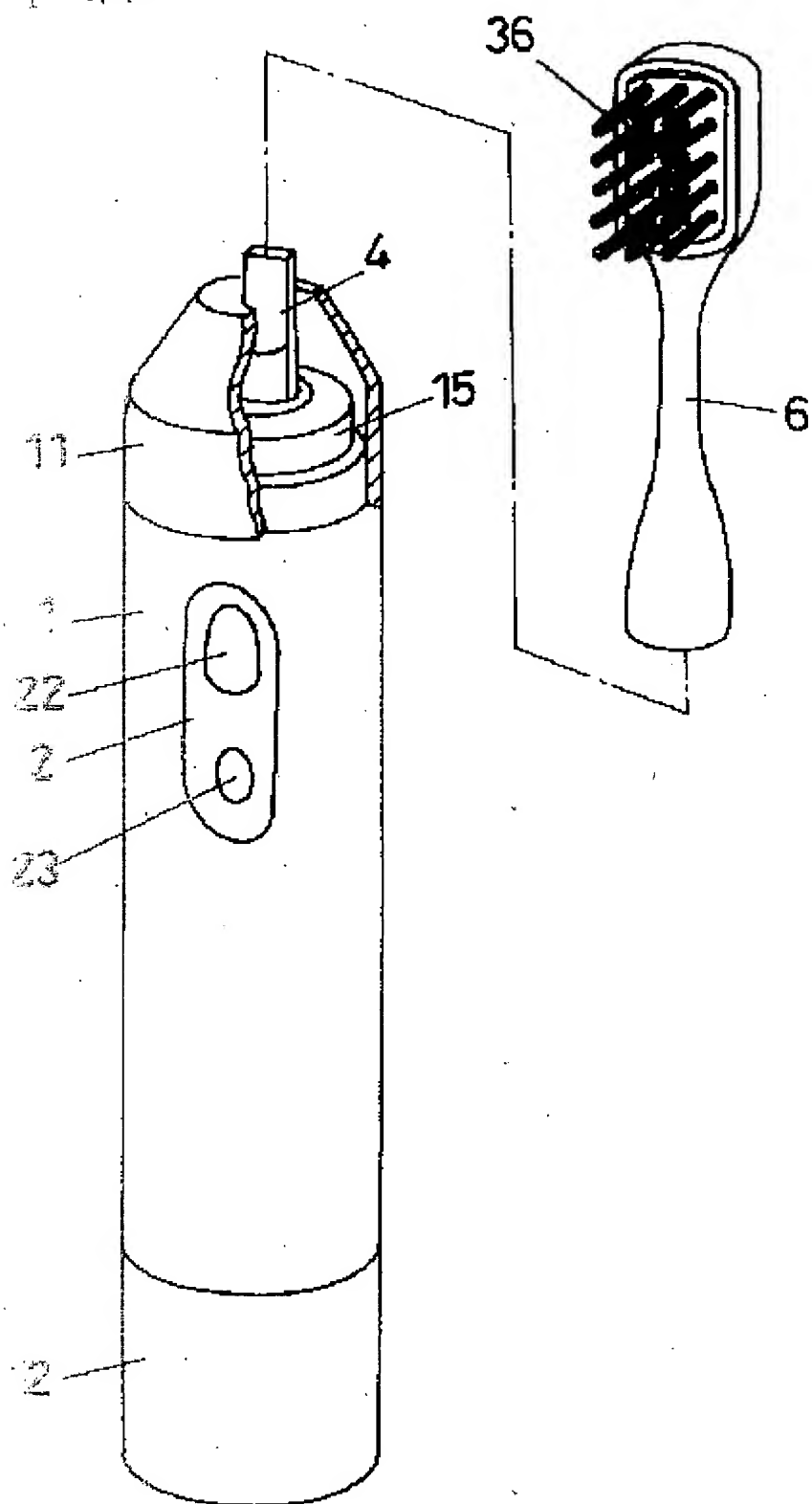
[0019] Moreover, in what was equipped with the straight-line reciprocating motion means of shaft orientations in the body, and equipped the body and the removable attachment with the rocking rotation means of the circumference of a shaft center, when toothbrushing which compounded a straight-line

reciprocating motion and rocking rotation is completed when this attachment is used, and the ** brush of only a shank and the brush section is used, it can be used in actuation of only a both-way rectilinear motion, and variety toothbrushing can be chosen.

[0020] Moreover, in what was equipped with the rocking rotation means of the circumference of a shaft center in the body, and equipped the body and the removable attachment with the straight-line reciprocating motion means of shaft orientations, when toothbrushing which compounded a straight-line reciprocating motion and rocking rotation is completed when this attachment is used, and the ** brush of only a shank and the brush section is used, it can be used in actuation of only rocking rotation, and variety toothbrushing can be chosen.

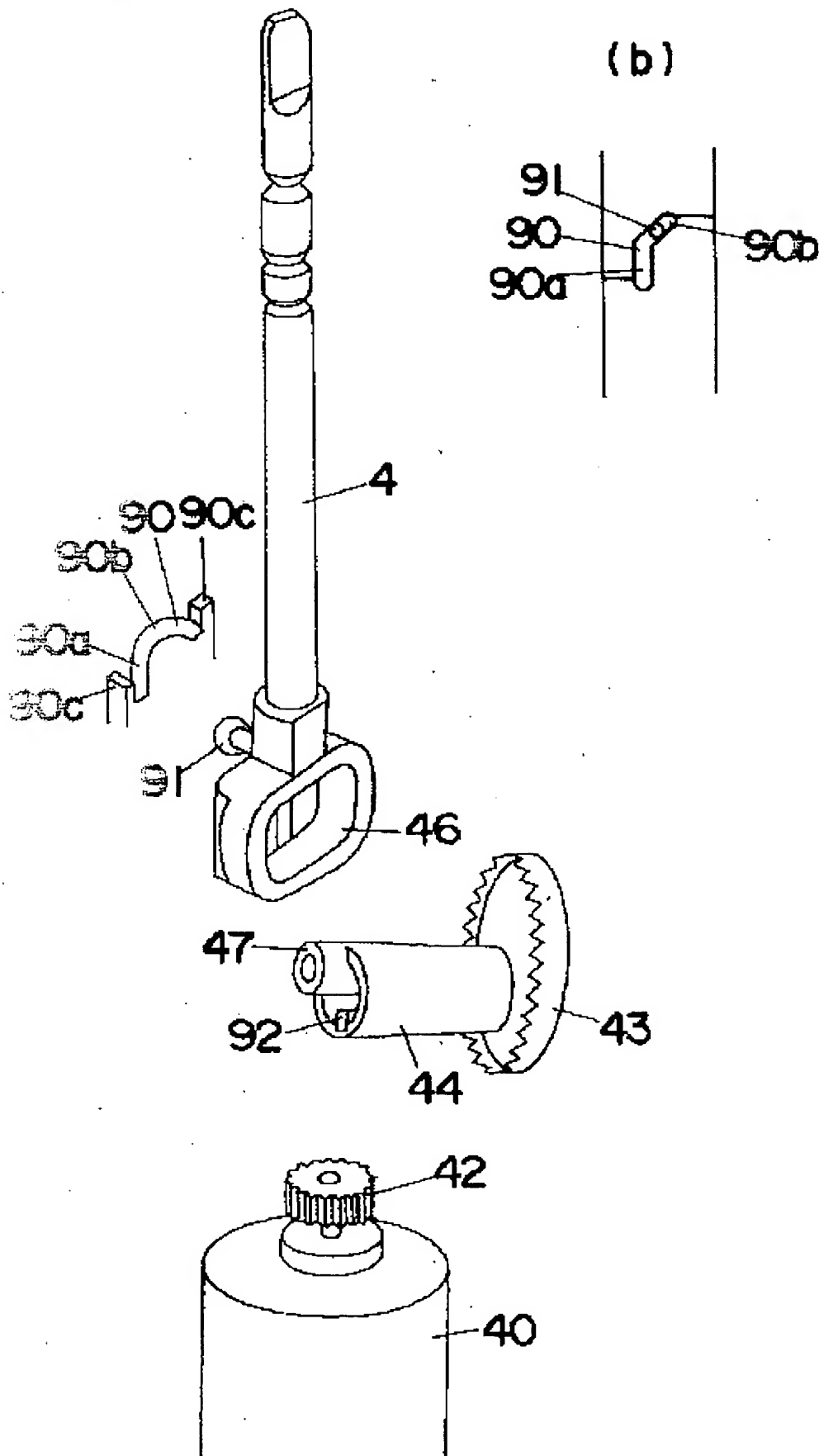
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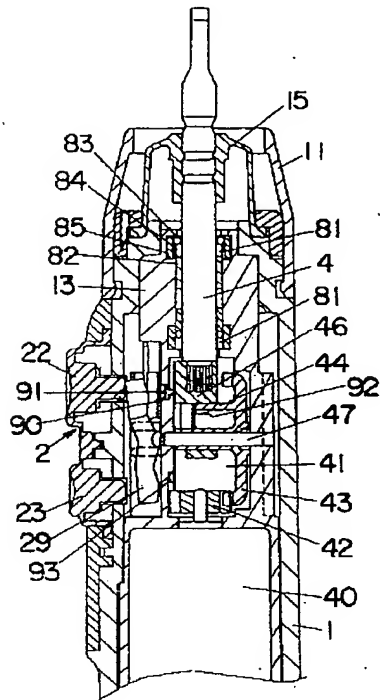


(a)

(b)

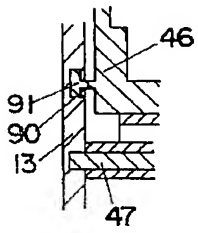


Drawing selection drawing 2



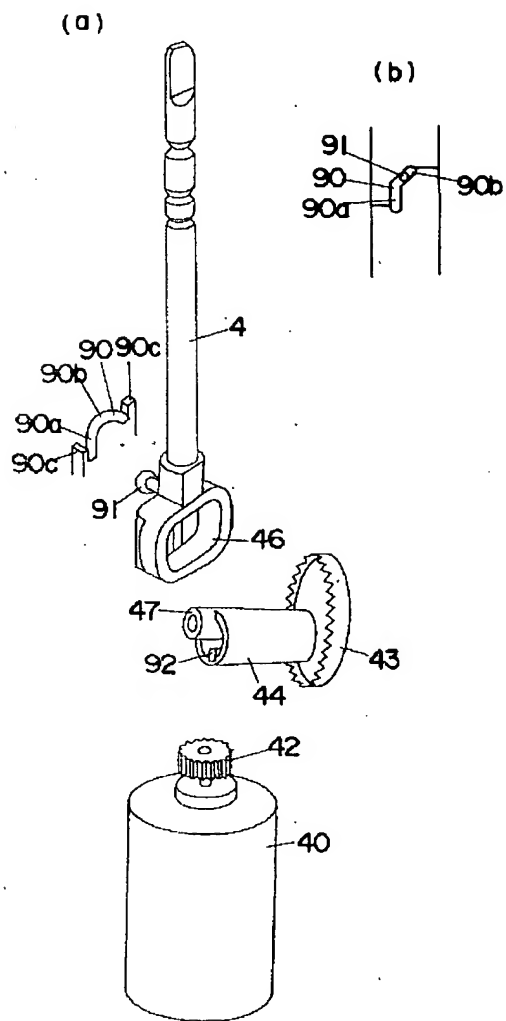
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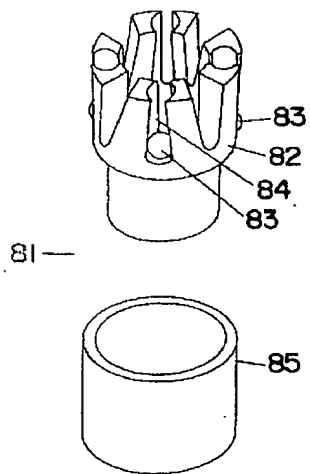
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Drawing selection | drawing 4



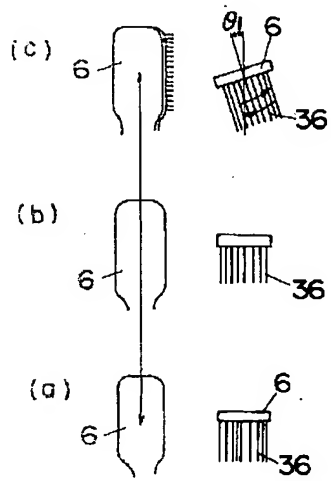
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Drawing selection | drawing 5



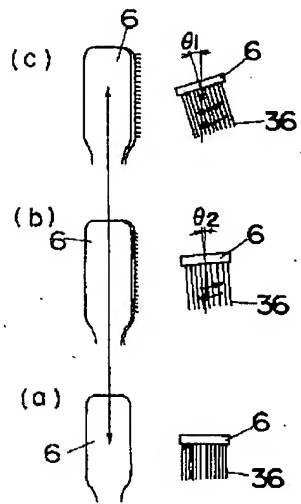
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Drawing selection drawing 6



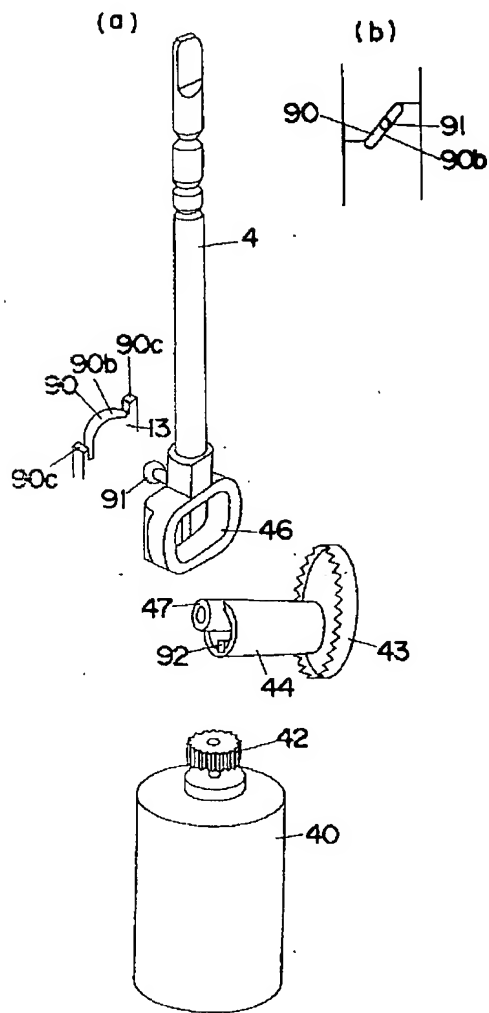
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Drawing selection | drawing 7



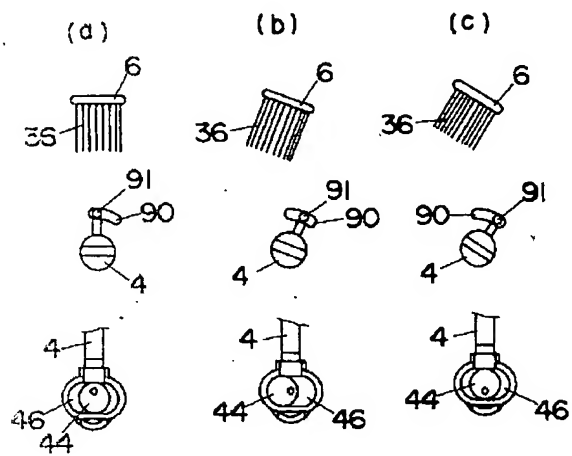
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Drawing selection drawing 8



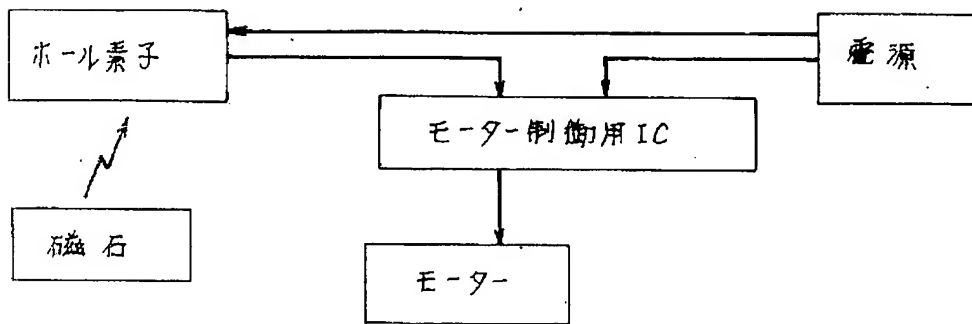
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Drawing selection drawing 9



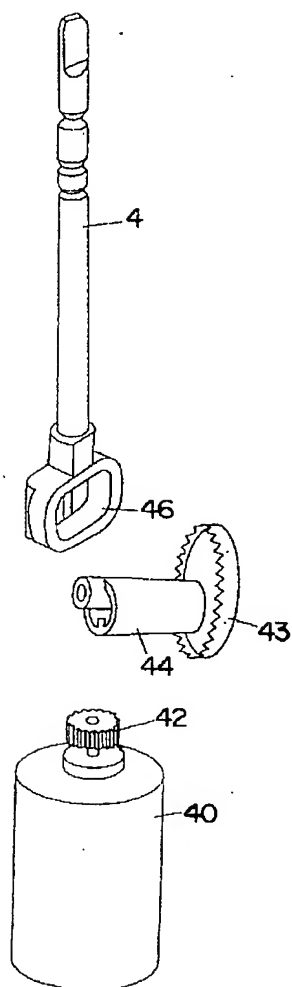
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Drawing selection, drawing 10



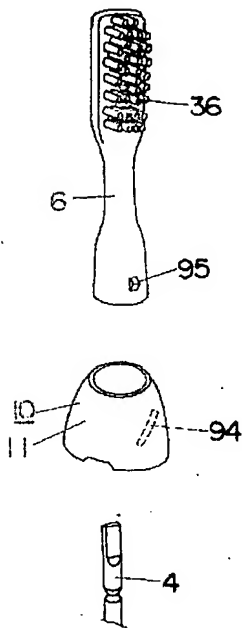
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Drawing selection [drawing 11]



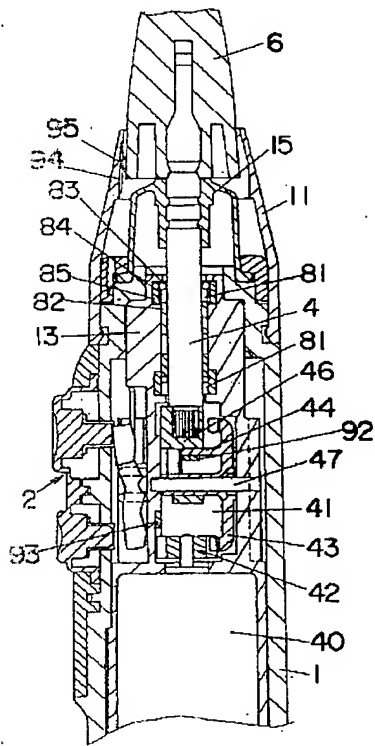
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Drawing selection drawing 12



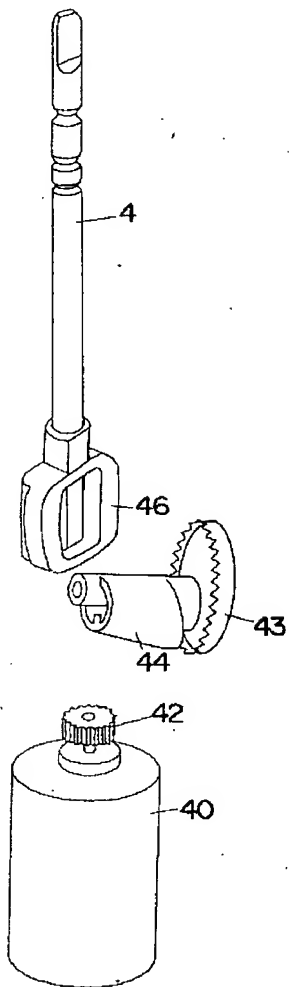
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Drawing selection drawing 13



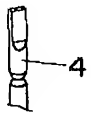
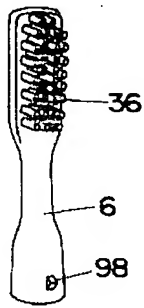
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Drawing selection drawing 14



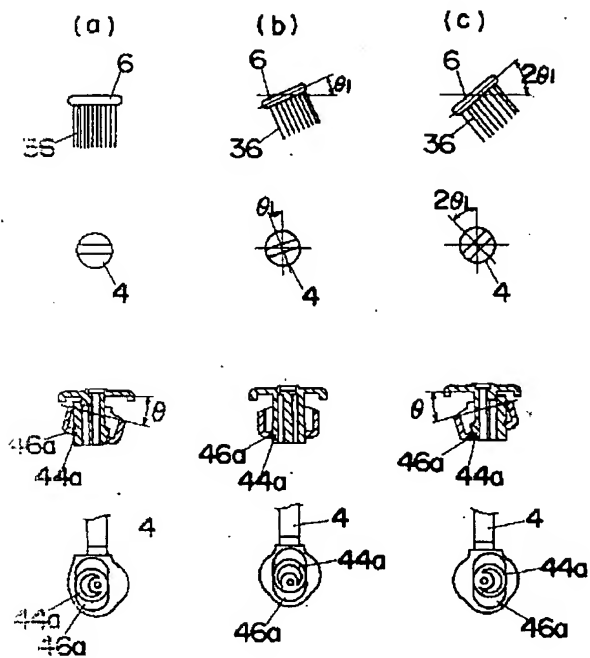
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Drawing selection drawing 15



[Translation done.]

Drawing selection drawing 16



[Translation done.]